InNovation
Customer Magazine of MicroNova
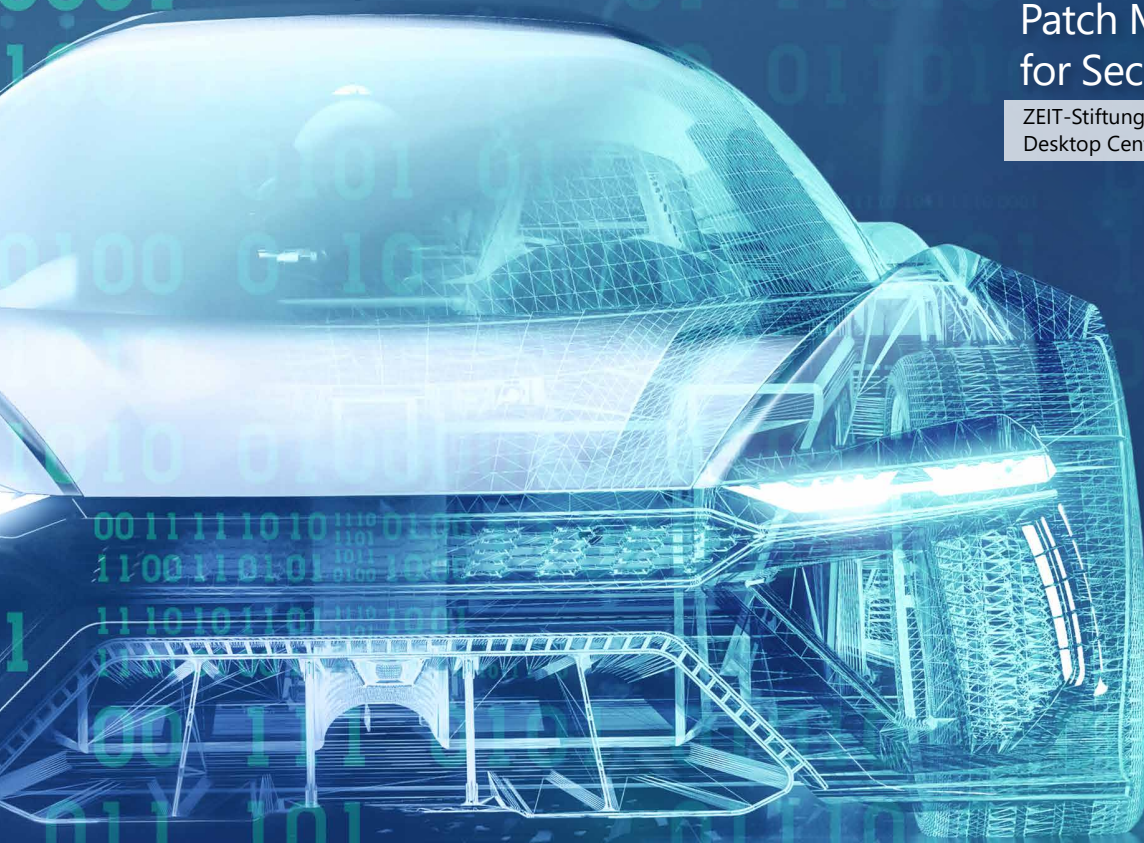
MicroNova
Software and Systems

Self Test for HiL Simulators
Optimal start of new test series due to perfectly functioning test systems

SMO-Architecture & Network Slicing
MicroNova solutions for more flexible and more dynamic mobile networks

Patch Management for Secure Computers
ZEIT-Stiftung relies on ManageEngine's Desktop Central

www.micronova.de

Challenging Times

Dear Reader

You probably feel the same way I do – that the state of crisis seems to never end. The events involved have ranged from the 2019 auto industry crisis, the 2020 Covid pandemic, and the 2021 computer chip shortage to the current tragedy of the war in Ukraine. Let us hope that the latter crisis, which is first and foremost a humanitarian catastrophe, soon comes to a peaceful end.

While we should be glad that we are not directly impacted by the Ukraine situation, it still affects us all. Uncertainty and even stronger concerns about inflation, coupled with the possibility of stagflation, are also having an impact in Germany, across Europe, and in many parts of the world. We need to do all in our power to maintain our confidence and strength in pursuing the aim of a successful future.

Part of that approach will involve continuing or even accelerating the transformation processes already underway. In the automotive sector, for instance, software and electronics will continue to grow in importance if the transformation of drivetrain technology is to succeed, while pre-test testing and efficient test automation will also gain momentum. Both these topics are covered in the three articles in the Testing Solutions section, which starts on page 4 of this edition.

Similarly, the demand for communication is unlikely to diminish in the challenging times ahead, along with the associated need for change. Here, too, developments are continuing steadily. The interview, on page 18, with Hinrich Bey, Head of MicroNova's Telco Solutions division, provides a fundamental overview of opportunities and possibilities in this area as well as some insights into our strategy for the coming years. A technology-focused piece about Services & Management Orchestration rounds out the contributions of the Telco Solutions division to this edition of InNOVAtion.

Irrespective of any crises, infrastructure still needs to function reliably and smoothly. This applies just as much to IT as it does to project management – two areas that are vitally relevant to MicroNova's portfolio. The ManageEngine team provides an update on the latest product news, starting on page 20, followed by a client testimonial. The section also includes a testimonial (from the automotive sector) for monday.com, the Work OS solution offered by MicroNova. This is complemented by an enterprise-level view of the benefits of professional project management using monday.com.

Our Supervisory Board – and therefore the family that owns MicroNova – are once again represented in this issue of InNOVAtion, this time in two pieces. Firstly, company founder Josef W. Karl looks back on 35 years of MicroNova – that's how long we have now been around. This personal article celebrates that anniversary. Secondly, Josef's son and sole shareholder Maximilian Karl gives his perspective on this long period in an interview and explains what motivates his long-term commitment to MicroNova.

I'll finish, as always, by hoping that you enjoy reading the magazine and wishing you health and, of course, a peaceful future.

Your Orazio Ragonesi

The Test Before the Test

The automatic validation of hardware-in-the-loop (HiL) systems before starting a test series ensures the proper functioning of the test equipment – and as such ensures reliable results and cost efficiency.

TEXT: Stephan Schmidt   PICTURES: © Gorodenkoff / Shutterstock.com
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Since the beginning of the 1990s, HiL systems have established themselves for the validation of ECU and control components in the automotive industry. Today, ECU testing on such test benches is an integral part of the development process to ensure the correct functioning of the components at an early stage. The main focus of testing is the software that runs on the ECUs. Since their functional scope is continuously growing, the need for reliable and efficient validation is also increasing.

The requirements for modern HiL systems are correspondingly high. Precision in the input and output signals is expected in order to deliver accurate test results and to meet quality standards such as ISO 26262. Validating the functionality of the HiL system before starting a test series is therefore a part of quality assurance. It saves costs that would have been incurred in the event of a defective test, because only flawless equipment delivers reliable test results. Therefore, in a HiL self-test, the test bench itself becomes the Device Under Test (DUT). The procedure is very similar to that used for ECU validation. It offers the advantage that the self-test can be integrated into the test suites of the existing automation. This means it is a simple task for the user to implement custom special tests.

NovaCarts HiL self-test

All tests included in the validation scenarios described below can be performed separately or compiled into a custom configuration – depending on the desired focus and reporting. MicroNova can also implement specific adaptations within the scope of customization. The concept is tailored to the HiL systems of the NovaCarts series, which contain corresponding options for self-testing. It can also be adapted to the customer's existing systems. MicroNova's consultants will be happy to advise on possible approaches.

The NovaCarts HiL self-tests from MicroNova are divided into six stages that build on each other:
» Quick test
» Limit value test
» Ramp test
» Full test
» Calibration test
» Qualification test

Quick test

The quick test checks the response of all channels installed in the HiL system and performs a back measurement of the control unit I/Os. This simple check of the basic functionality of the system allows the test operator to assess the readiness of the test bench. A quick test is usually carried out after ECU conversions or before tests with a very long runtime. Its focus is a quick statement about the basic system status.

For example, the failure of a channel can be detected – and ideally rectified – immediately before a test suite is started. No valuable test time is lost. Any repair work can be requested precisely or, depending on the severity of the problem, carried out directly by the user. In some cases, it is enough to replace a fuse or plug a connection which has been overlooked.

Limit value test

This test extends the scope of the quick test by checking the limit values of the channel specifications. This means the test takes longer, but in return is also more informative. Customizations can be implemented by MicroNova's consultants or by the customer.

A limit value test can be carried out either as an open-loop or a closed-
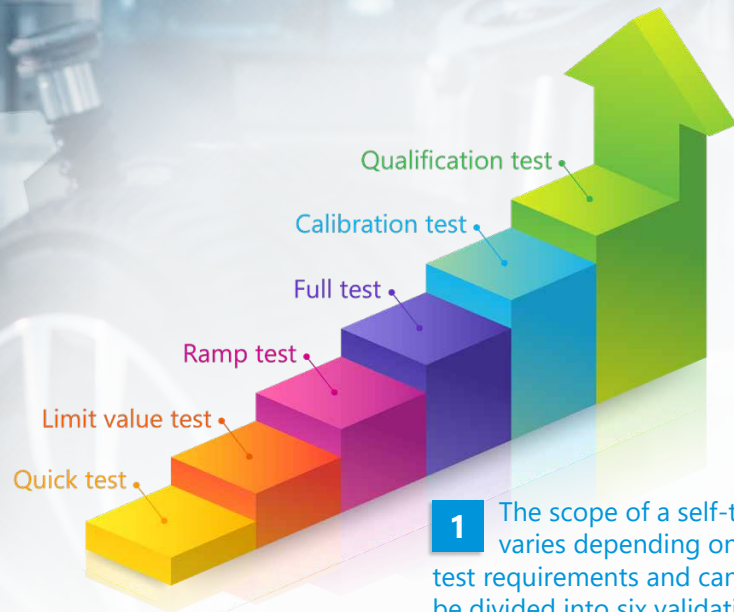
1 The scope of a self-test varies depending on the test requirements and can be divided into six validation scenarios.

loop test. It starts with a definition whether ECU limits or channel limits are to be tested. For open-loop, channels can be tested to their maximum limits without risking damage to the ECU.

The decisive factor for selecting the respective method is therefore the assessment of whether the DUT would be put at risk during the test because the limits used are outside the specification of the ECU. If this is the case, the open-loop test should be chosen. The same applies to ECUs whose measuring channels have an impact on the back-measurement.

Ramp test

The ramp test includes all checks from the quick test and limit value test. In addition to the channel limit values, the value range defined in the data sheet is tested with previously defined interpolation points. The required behavior of the slew rate of individual signals is verified. Individual customer requirements, such as a lower bandwidth or resolution, can also be implemented here.

Full test

In the full test, the value ranges of the channels are sampled in full. This allows for a comprehensive test of the resolution and the slew rate. In addition, different signals are combined with each other in order to test and document any cross-influence.

Calibration test

The calibration test uses the information from the full test to generate as much data as possible for calibration of the HiL system under test. The extent to which this is possible depends on the available instrumentation and the calibration requirements.

Qualification test

The qualification test is the highest standard: It uses all tests of the validation scenarios described above. The result is an automatically generated qualification report that can be used to provide evidence in the assessment according to ISO 26262.

All the system tests mentioned can optionally be carried out with various measuring devices already available or included in the HiL system. If required, external measuring hardware can be connected via an additional interface

to provide independent values. The reports on the individual validation scenarios are generated automatically and stored in the customer's respective test data management system, or they can be exported in various formats.

Optimizing the quality and costs of testing

Self-testing is essential, especially against the backdrop of quality standards in the automotive industry, such as ISO 26262. Thus, companies can fulfill the obligation to provide evidence of the proper functioning of the test systems used, as required by the standards. Another advantage comes into play when using the quick test: the acquisition costs of HiL systems mean that efficient use is vital. However, this is not possible if valuable test time is lost because, for example, an unconnected line or a defective fuse was overlooked when commencing a long test run. So in addition to quality assurance, a self-test beforehand also contributes to cost savings. ■

High Five!

The new version 5.0 of the test automation solution EXAM will be available from MicroNova from July 2022. The free tool contains all previous features as well as lots of new innovations and interfaces.

TEXT: Christian Demmelmeier, Franziska Freund, Tim Warode
PICTURES: © kitti Suwanekkasit, CoreDESIGN, anttoniart / Shutterstock.com

EXAM 5.0 is a major new version with a number of improvements that focus on user-friendliness. For example, the operating concept in EXAM has been optimized on the basis of analyses and user workshops – the result is a new concept for perspectives and search. This makes test creation more intuitive and more efficient.

The new version also takes into account the increasing number of variants in vehicle ECUs: Because as more and more variants need to be tested, additional efficiency is required in test creation and test management. The new parameter concept in EXAM 5.0 therefore ensures a high level of user-friendliness despite the increasing number of tests.

Car manufacturers use various test management applications in order to make test processes as efficient as possible when validating the software of electronic control units. In the past, EXAM created a standardized interface that made it possible to easily connect the various systems. With EXAM 5.0, the spectrum has been expanded again and an additional Application Lifecycle Management (ALM) tool, known as codebeamer, has been added.

The storage system for reports has also been updated: As an enterprise application, EXAM enables a centralized IT mode for test creation. In previous versions, however, reports were stored locally. In EXAM 5.0, this also becomes a central solution and data can be stored securely and centrally for all users.

The new QuickSearch is another feature that users will notice immediately. It makes searching for desired elements quick and straightforward. Its search bar can be found in browsers and wizards, so it is always available directly where needed. In addition to element names, you can also search for IDs, UUIDS, links and fullnames. Instead of searching manually in the model browser, the desired function is directly available for the test implementation.

Another key innovation is the toolbox: it simplifies access to all elements required for modeling or administration. The ToolboxView is always linked to the current editor and shows the user only those elements that can be used in the current context.

Intuitive parameter concept

ECU variants have long played an essential role in validation, but are becoming increasingly important as the number of functions to be validated grows. For EXAM 5.0, MicroNova has therefore developed a new parameter concept that can replicate variants even more clearly and that at the same time is flexible and easy to use.

For better reusability, test sequences and the parameter values to be used during execution are edited and maintained separately in EXAM. Previously, these values were defined and assigned solely by means of ParameterSets and Compositions in several different editors. This concept remains in place: A test case parameterized in this way is now known as a LegacyTestCase. If the new parameter concept is used, it is called TestCase as usual.

The central element in the new parameter concept is the ParameterTable. From now on, the parameter values will be defined in this powerful editor, which groups the individual parameters in columns, while the respective variants are presented in rows. When a test case is executed, the sequence diagram is executed once for each variant with the corresponding values.

Perspectives and search

Until now, EXAM offered a separate perspective for each use case. However, experience has shown that users focus more on element types than on perspectives – and had to constantly switch between perspectives in practice. In EXAM 5.0, there is now only one perspective for the entire modeling: Modeler, VariableMapping, EventMapping, SystemConfiguration and Tagging are found in the Modeler perspective.

1 Different variants can be entered in the ParameterTable for each individual parameter. When the test case is executed, the sequence diagram runs through once for each variant.

Each TestCase has a ParameterTable like this. Variants and values can also be created in a separate table so that they do not have to be redefined each time. TestCases or their Parameter-Tables can inherit from these templates, i.e. they have the same values, and can then be individually adapted and extended. The cell colors, familiar from previous EXAM editors, show at a glance in which table a parameter value has been defined.

To further increase flexibility, it is also possible to inherit from multiple Parameter-Tables, so that different aspects of a test case can be inherited together, so to speak. This option is particularly important because the parameter values in EXAM 5.0 – unlike the previous concept – apply globally to the entire TestCase, i.e. also to all TestSequences which have been accessed.

Numerous interfaces also enable seamless integration of the new concept into existing projects: Existing parameters can be assigned values both as before with ParameterSets and now via ParameterTables. This means that existing TestSequences

can be accessed by both legacy and new TestCases without any adaptation. In addition, LegacyTestCases can also be converted into TestCases.

Connection to codebeamer

EXAM 5.0 also offers a significant enhancement in terms of test management: The ALM tool codebeamer from Intland Software is the latest member of the family of systems that can be coupled with EXAM via the proven TestSpec Synchronizer (TSS). In order to optimally support how codebeamer works, MicroNova has extended the TSS to work with baselines. This means that the latest version of a test specification, as well as labeled version statuses, can now be synchronized with EXAM. In future, other ALM tools that work with baselines or comparable concepts can also benefit from this change.

However, the codebeamer connection offers even more functions that go beyond the scope of the TestSpec Synchronizer: Test runs compiled in codebeamer can be executed in the correct version directly in EXAM and

the test results can be exported back to codebeamer. This gives users a complete overview of the test status and test results in codebeamer. Moreover, EXAM test cases are also linked in codebeamer to support the review process and to achieve optimum traceability.

Measurement data and reporting

EXAM 5.0 places the reporting of test results on a completely new technical basis. Similarly to what has been done to modeling, the developers have introduced a 3-tier architecture here, which ensures reliable and powerful storage and analysis of test results even between different sites and across national borders. At the heart of the solution is the new service group consisting of ReportService and FileService. Together they ensure the secure, central storage of reports. In combination with the newly developed web application, they also offer the possibility of evaluating reports from any location – even without an EXAM client being installed.

To store test results centrally, a modern AWS S3-compatible FileStore is used in addition to a database, in which real-time measurements, log files and attachments are stored. These usually account for the majority of the data in a report. This procedure takes some of the load off the database and ensures cost-effective use of the storage solution. In addition, a new role and permissions system supports the users in clearly delineating competences and responsibilities in the central storage system, and at the same time prevents unauthorized access to report data.

Another new feature is the local storage of report data as safeguard against temporary network failures during transfer to the ReportService.

	Variant	Execution Order	StartWerte		Auto	ErwartetesErgebnis
			initGeschwindigkeit	steigungStrasse	Reifen	maxBremsweg
1	<default>	-	0	0	Allwetter	
2	sehrLangsam	5	15	-6	Allwetter	3
3	langsam	10	30	0	Allwetter	4
4	mittel	20	50	0	Allwetter	10
5	schnell	30	80	-10	Sommer	55

2 Variants and values for a TestCase can be inherited from several ParameterTables in EXAM 5.0 - and thus combined more flexibly.

Reports are only deleted when the respective test report is available in full and without errors on the ReportService. There is also a function that can be used to migrate legacy reports from a database to the ReportService.

Reports are evaluated exclusively via the newly developed web application, which offers many useful functions for this purpose in addition to a clearly arranged user interface. Highlights include a dashboard for quick access, extensive filter options, a context-sensitive evaluation of log files, and the graphical analysis of real-time measurements. The structure and content of the reports remain largely unchanged, so that users can easily find their way around in the new version. The classic reporting consisting of EXAM Report Manager and local report database is still available.

Conclusion

With EXAM 5.0, MicroNova presents a major new version and with good reason: The test automation solution has been comprehensively modernized to offer a user-friendly performance spectrum for current and future test requirements. In addition to numerous usability improvements, the extensive feature packages for reporting, parameterization and codebeamer create considerable added value in daily practice. ■
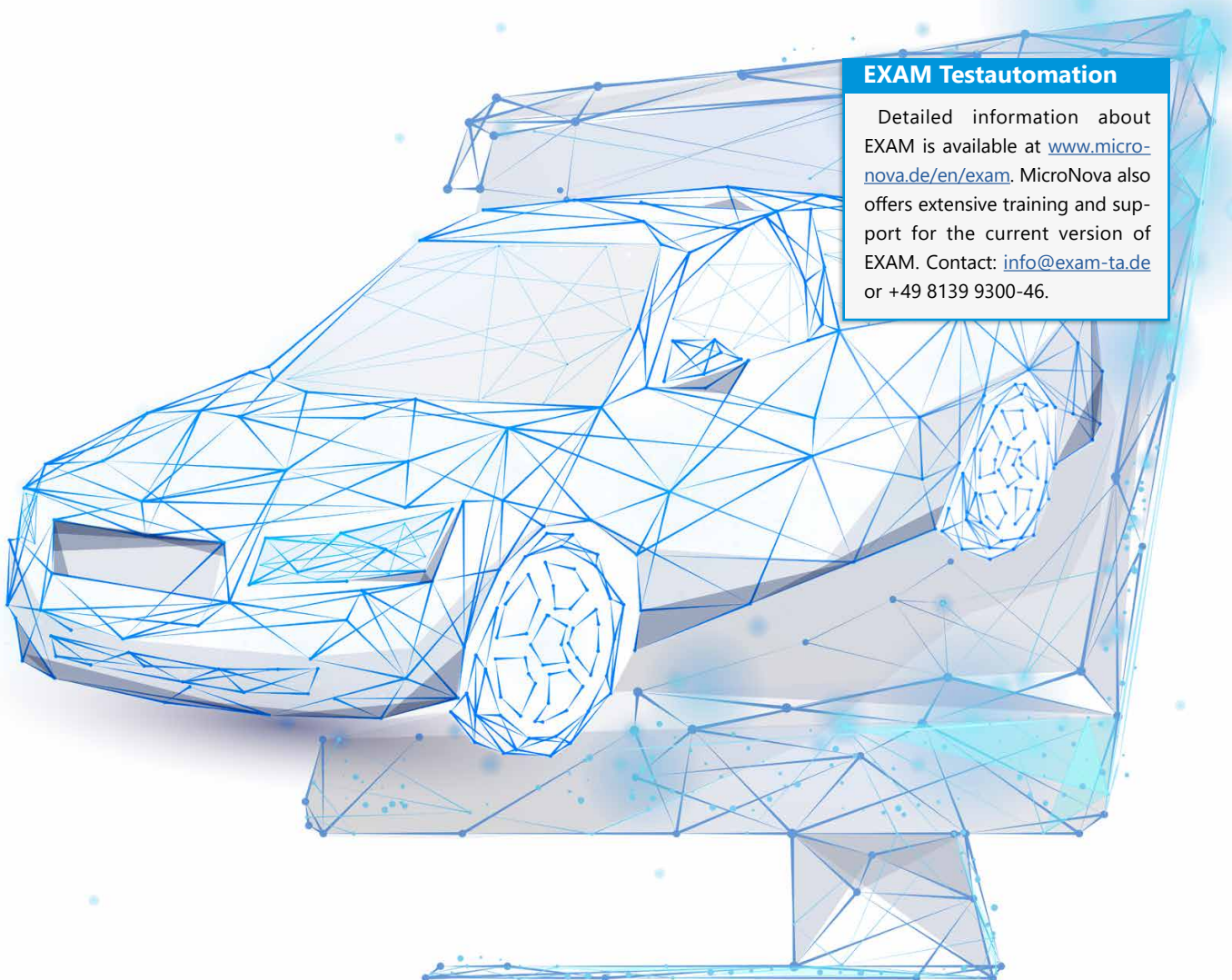
EXAM Testautomation

Detailed information about EXAM is available at www.micronova.de/en/exam. MicroNova also offers extensive training and support for the current version of EXAM. Contact: info@exam-ta.de or +49 8139 9300-46.

EXAM ALM Synchronizer

Synchronizing test cases and test results between ALM systems and EXAM

TEXT: Editorial staff   PICTURE: © Open Studio / Shutterstock.com

Automobile manufacturers utilize several different applications for test management purposes. This allows them to make test processes for validating the software of Electronic Control Units (ECUs) as efficient as possible. Application Lifecycle Management (ALM) systems are used for developing, refining, operating and supporting ECU software. Test automation solutions such as EXAM must therefore communicate with these ALM tools in order to receive test specifications and feed results back accordingly.

Automated synchronization

However, manually reconciling this data on an ongoing basis between the test automation solution and the ALM tool can easily give rise to errors and, for larger numbers of tests, is too time-consuming. The new EXAM add-on "EXAM ALM Synchronizer" enables the automatic transfer of the test specification of the software under test between the respective ALM application and EXAM.

During synchronization, test specifications, attributes, descriptions and statuses are transferred from the ALM tool to EXAM, providing the basis for generating test cases. The test cases are then implemented and executed in EXAM. The synchronization process

Application Lifecycle Management (ALM)

ALM describes the lifecycle management of software and is used to monitor an application from the idea and planning stage through development and operation to the end of support. An ALM system also includes the documentation of changes to an application.

also highlights differences and allows them to be transferred back to EXAM.

The EXAM ALM Synchronizer feeds the results straight back to the ALM tool once the test has been completed, providing an up-to-date overview in the tool. Synchronizing data between the ALM system and EXAM in this way makes for a reliable, efficient and fully traceable test process.
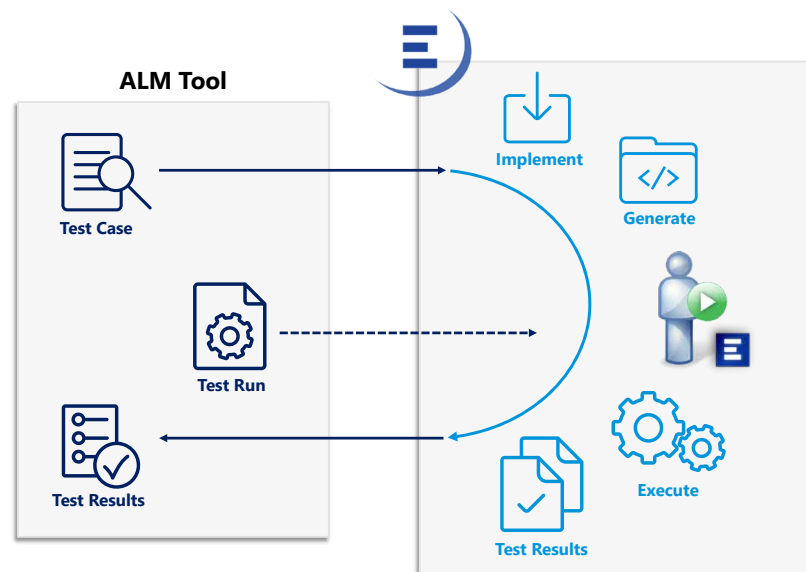
ALM Tool

Test Case

Test Run

Test Results

Implement

Generate

Execute

Test Results

1 For an efficient test process, ALM tool and test automation solution have to communicate with each other.

test management. This creates the traceability that is required for passing the assessments for Automotive SPICE and ISO 26262.

Provides process stability and reduces error: The automated, continuous process significantly reduces the likelihood of synchronization errors, thus contributing to quality assurance.

Cuts costs through automation: The synchronization process is time-efficient and therefore costs less than manual data reconciliation.

Provides a basis for further development: The EXAM ALM Synchronizer makes the latest test results available quickly for further analysis in the ALM application. Analyses may cover such matters as test coverage and the errors still present in the test object. This is facilitated through direct transparency.

Lays an ideal foundation for TCG: Because the test specifications end up in EXAM automatically, use of the EXAM ALM Synchronizer provides the perfect basis for utilizing the Test Case Generator (TCG), which employs a

keyword-driven approach to generate test cases automatically. You can find more information at www.micronova. de/en/TCG. ■

Licensing model

The EXAM ALM Synchronizer is available under a floating license. Both rental and purchase licenses are available in different packages with graduated pricing. Please contact sales-testing@micronova.de for an individual offer.

More Info:

The EXAM ALM Synchronizer currently supports the following tools:
» IBM Engineering Test Management (ETM)
» PTC Windchill
» Siemens Polarion
Please do not hesitate to give us a call on +49 8139 9300-46 or email us at sales-testing@micronova.de if you wish to connect other ALM systems.

Benefits of the EXAM ALM Synchronizer

Keeps test specifications in sync: Specifications can be transferred from the respective ALM system to EXAM without the need for manual input. The attributes also allow additional information to be made available in both tools. Additionally, synchronization highlights differences in specification status between the respective tools, thereby helping to make targeted adjustments to the test cases.

Ensures full traceability in the test process: Automated synchronization ensures that a unique ID, including attributes, is used for each test case, all the way from the ALM system through automation to the result and back to

SMO Architecture & Network Slicing

New application scenarios around 5G and Internet of Things (IoT) require flexible and dynamic mobile networks. MicroNova has the solutions for this, thanks in part to Services and Management Orchestration (SMO) architecture and network slicing.

**TEXT: Ingo Bauer   PICTURES: © Photobank.kiev.ua, samoila ionut / Shutterstock.com;
© kstudija / Fotolia.com**

The introduction of the 5G standard in telecommunications has ushered in a new era for network operators. New classes of service, including quality of service, make it possible to map an almost unmanageable variety of new, customer-specific use cases. For the network operators, this means that a change is taking place from a – in terms of services – previously by way of comparison rigid radio network to a fully dynamic, highly flexible, service-oriented one. The keyword is SMO – Service and Management Orchestration.

SMO – The service takes center stage

The structure of an SMO architecture can be subdivided both horizontally into abstraction layers and vertically into network domains.
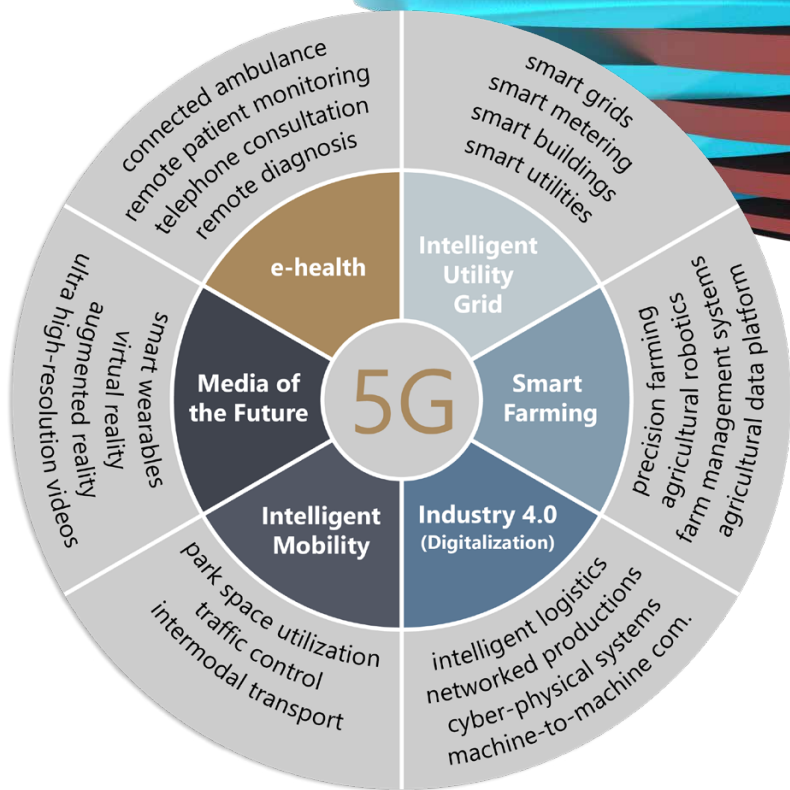
**1** Application domains of 5G networks
© Bundesregierung

The complexity of the use cases or parameters to be supported rises steadily as you move through the horizontal layers. At the service layer (Service or Multi-Domain Orchestrator), the service is still defined or described in a very abstract way on the basis of defined KPIs or service quality relevant for the end user (see diagram). The Multi-Domain Orchestrator or E2E Service Orchestrator interprets these requirements and automatically distributes associated jobs to the respective network domain with accordingly detailed requirements prepared for the particular network segment. The Domain

Orchestrator receives these and uses them to initiate the prerequisite steps for service provisioning.
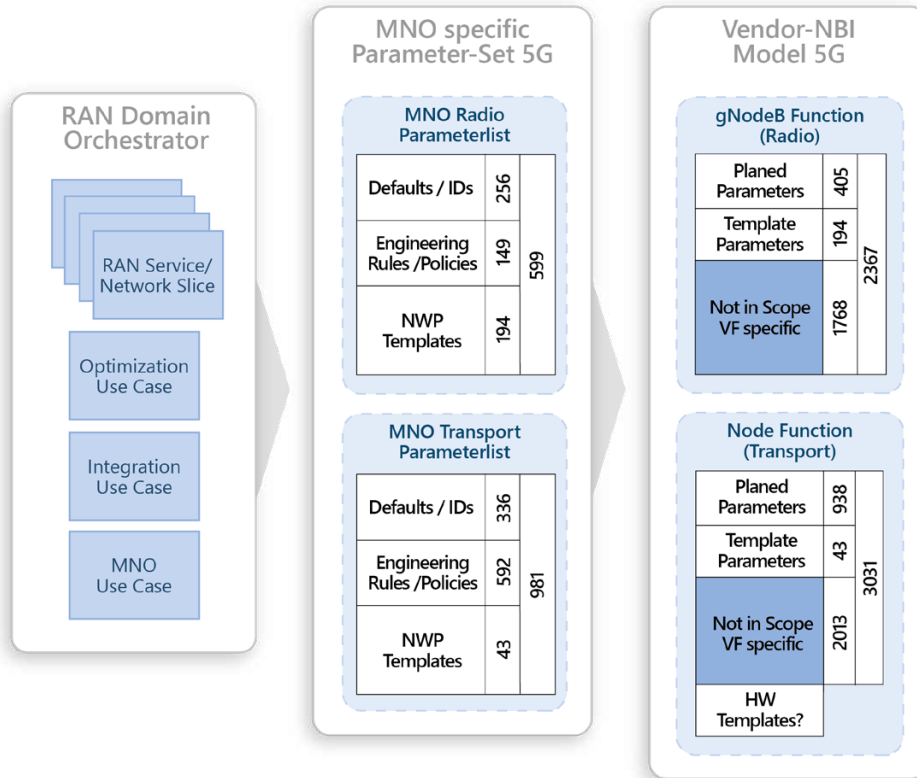
In addition to checking and reserving the required network resources, this also includes setting up the needed control loops for subsequent quality assurance and finally activating the service in the network. Communication with the network takes place via the domain-specific SDN Controller, which – since it is in close proximity to the network – has the highest level of detail and must know and operate the respective manufacturer- and technology-specific models including their properties. At this level, the very specific network design of the according operator also comes into play (see figure).

Network Slicing

Previous mobile radio technologies are based on a relatively rigid radio network that is impossible to expand for different applications without considerable effort. While the further development of LTE technology already enables conditional scaling, for example via narrowband IoT (NB IoT), a great deal of 'manual' effort is still generally required for network management – both for engineering and in operation. As an essential link between service and network, only network slicing offers the fundamental technological basis for making a service-oriented mobile network economically accessible to the customer and the network operator – because it enables network operators to divide their existing Radio Access Network (RAN) into 'network slices'.
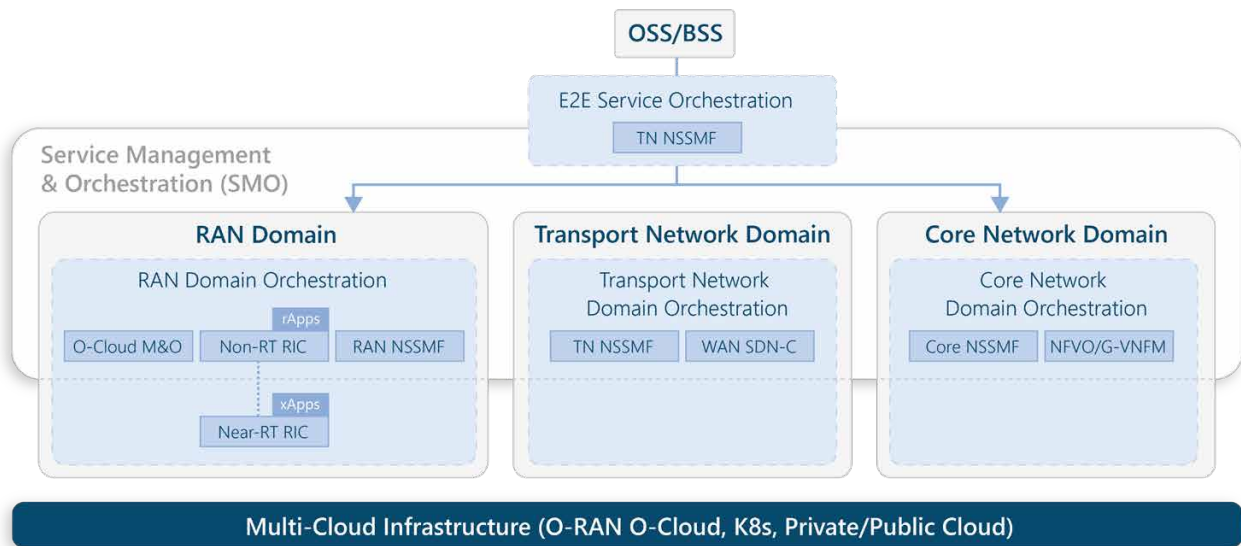
2 The illustration shows a typical SMO architecture. It usually consists of one or more orchestration platforms with different abstraction levels or for different network domains.

MNO specific Parameter-Set 5G		
MNO Radio Parameterlist		
Defaults / IDs	256	
Engineering Rules /Policies	149	599
NWP Templates	194	
MNO Transport Parameterlist		
Defaults / IDs	336	
Engineering Rules /Policies	592	981
NWP Templates	43	

Vendor-NBI Model 5G		
gNodeB Function (Radio)		
Planed Parameters	405	
Template Parameters	194	2367
Not in Scope VF specific	1768	
Node Function (Transport)		
Planed Parameters	938	
Template Parameters	43	3031
Not in Scope VF specific	2013	
HW Templates?		

RAN Domain Orchestrator
- RAN Service/ Network Slice
- Optimization Use Case
- Integration Use Case
- MNO Use Case

3 Parameter mapping in COM5.SDN RAN Controller

These can be seen as virtual, independent networks that can be specifically adapted to the needs of the respective customer and made available to them. The basis for a service-oriented network can be created by also defining services and their quality. This includes, for example, solutions in the field of smart homes or autonomous driving. As the rollout of 5G technology progresses, slices can even be offered on a time and location basis, which saves costs.

This opens up a service- or application-oriented allocation of network resources for mobile network operators (MNOs), with a specific quality of service (QoS) for customers and end devices. With network slicing, Vodafone expects that "(...) in the future it should be possible for customers to pre-order 5G slices required for applications in a self-administration portal or 'shop system' for a specific location and a specific period of time. This means that on-demand network connectivity for the next industrial revolution can be ordered with just a few clicks of the mouse. And at a lower price – a far cry from the investment that companies would have to make to provide a defined, high-quality network connection at the required location by other means."

Network slicing enables MNOs to map their network as independent, logical, isolated end-to-end segments on a physical infrastructure. By prioritizing network traffic or flexibly allocating the associated resources, it is possible to grant customers different quality assurances (Service Level Agreements, or SLAs for short) and/or offer extensive customization. The basis for being able to offer such a range of services is the SDN/NFV architecture, which is what makes the concept of a highly flexible, dynamic, and scalable network slice possible in the first place (cf. InNOVAtion 2-2020). The figure on (1) shows a 5G structure with the different layers or network domains.

COM5.SDN RAN Controller

The COM5.SDN RAN Controller developed by MicroNova follows the O-RAN paradigm by providing a global network view by means of a logical centralized controller. The focus is on a vendor-independent, standardized southbound interface based on O1: A REST interface to a web-based user interface is complemented by other such connections to other (RAN) apps, for example to the COM5.SDN Radio Intelligence Controller. To give a high degree of automation, the controller provides an abstraction of the network keys, performance indicators (KPI) and configuration parameters; clarification is required in advance of integration on account of the respective customer-specific mapping.

Basically, the COM5.SDN Radio Controller provides the functions of a classic element management system (EMS) with regard to fault, configuration, accounting, performance, and security management (FCAPS). The following overview shows its main functionalities:

» Reads out the entire network configuration and topology
» Automatically adopts network planning data for the configuration of the static part of the network
» Supports integration use cases for an initial configuration of the O-RAN components (rollout) while supporting different split scenarios
» Provides RAN resource management
» Reconfigures and optimizes the network
» Performs RAN parameter changes
» Allows RAN feature activation/deactivation
» Reads out performance parameters cyclically from the network
» Reads the RAN component error memory
» Provides all parameters and functions via a REST interface for other RAN apps

In its initial implementation, MicroNova integrated the COM5.SDN Radio Controller into an ONAP (Open Network Automation Platform) environment and implemented it on the basis of the OpenDaylight framework. The COM5.SDN Radio Controller essentially consists of the following components:

» RAN Configuration Manager
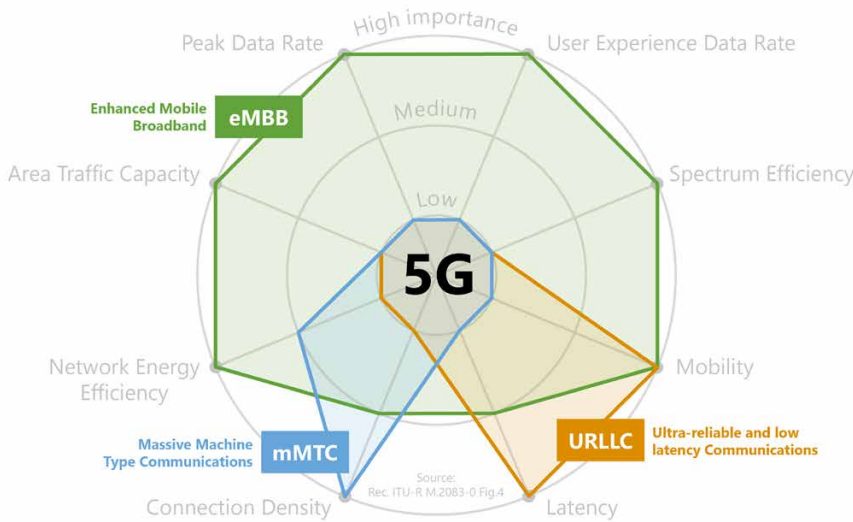» RAN Statistic Manager
» RAN Topology and Inventory Manager

Network slicing and KPIs

The table on next page describes the 5G standard KPIs according to ITU-2020 of the International Telecommunication Union (ITU) including mapping to the 3GPP service classes. Derived from this is the definition of a 'virtual' network slice, which ultimately gives the provider or receiver of a service the same service or network slice from the classes of Enhanced Mobile Broadband (eMBB), Massive Machine Type Communications (mMTC), and Ultra Reliable Low Latency Communications (URLLC).

KPI / feature	Description	Requirement	5G use case
Peak data rate	Maximum data rate to be supported	20 Gbps	eMBB
User experienced data rate (perceived data rate)	Data rate that should be available for the user experience 95% of the time.	100 Mbps	eMBB
Latency	End-to-end packet delay	4 ms 1 ms	eMBB URLLC
Mobility	Maximum speed for hand-off and QoS	500 km/h	eMBB URLLC
Connection Density	Total number of devices per area unit	10-6 / km^2	mMTC
Energy Efficiency	Energy consumption of data transmitted / received per unit (device or network)		eMBB
Area Traffic Capacity	Total traffic in service area	10 Mbps/m^2	eMBB
Peak Downlink Spectrum Efficiency	Throughput per unit, radio bandwidth and network cell	30 bps/Hz	eMBB

4 KPI definition according to ITU-2020 with mapping to 3GPP service classes

The following diagram presents these variables in graphic form and enables appropriate monitoring.

The standardization and further development of 5G and the next-generation networks are discussed and promoted in various bodies around the world, such as 3GPP, ITU, ETSI, O-RAN Alliance, and NGMN. Various use cases are implemented and tested, and existing ones are further developed and new ones specified, in connection with a large number of research projects.

The essential prerequisite for network slicing is a fully integrated, automated SDN architecture. Increasingly, open source solutions and platforms, such as the Open Network Automation Platform (ONAP), are playing an important role for network operators. In addition, approaches built on Artificial Intelligence (AI) and Machine Learning (ML) are becoming more and more important for telecommunications providers (see InNOVAtion 01-2021).

5 Network Slicing KPIs at a glance

Conclusion

The many years of experience in the area of automating network setup and network operation processes for two of the three German mobile network operators through COM5.Mobile, the continuous development/expansion of expertise in the area of AI/ML, as well as access to a completely open source-based ecosystem (OSNL) through its collaboration with 5G BERLIN e. V., all enable MicroNova with COM5.SDN to offer network operators an essential component of the SMO architecture and to thereby tap the advantages of network slicing technology.

The portfolio ranges from the automation of radio network-specific use cases such as site integration to network optimization using its COM5. Mobile products. Similarly, the COM5. SDN Mediator can be used to integrate an existing network into a leading-edge SDN architecture. Other possibilities include the integration and management of the specific network and service design, or of slice templates by means of policies through to the integration into functional components via microservices. ■
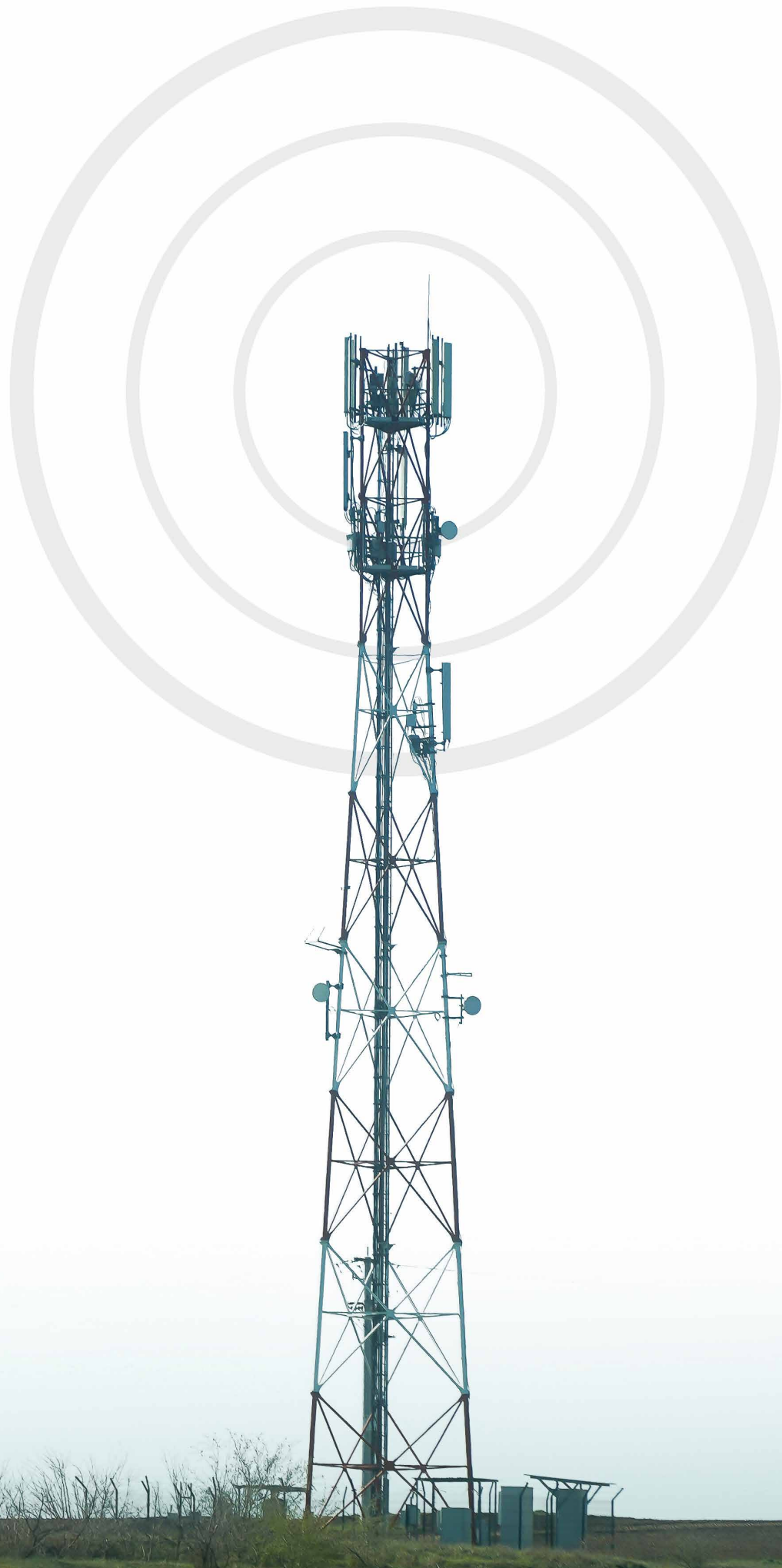
Engagement with Impact

Hinrich Bey has been Director of the Telco Solutions division at MicroNova since the beginning of 2022. The InNOVAtion editorial team had a conversation with him about the market and new solutions for 5G.

TEXT: Editorial staff   PICTURE: © PopTika / Shutterstock.com

InNOVAtion: You have spent more than half of your professional life directly involved in matters of telecommunications and have also gained additional B2B experience – with this wealth of experience, how do you see the current evolution in mobile communications towards 5G technology?

Hinrich Bey (HBE): The introduction of 5G is possibly the biggest change the industry has ever faced. And I don't mean the technology per se, rather the applications. Neither 3G nor 4G offered such opportunities; 5G is a new chapter in the B2B environment in terms of scenarios. For example, with network slicing and private networks, concrete industrial use cases are being created with applications that rely on some inherent, key 5G functionalities. I can name Enhanced Mobile Broadband (eMBB) for handling large amounts of data, Massive Machine Type Communication (mMTC) for the Internet of Things (IoT), or Ultra Reliable Low Latency Communications (uRLLC) for autonomous driving as examples. Looking at this overall picture, we get a sense of the economic and even societal implications of 5G.

InNOVAtion: The application side still seems to be lagging behind?

HBE: Of course, the industry must continue to develop consistently to be able to make these use cases a reality. Penetration will increase over the next few years, meaning that it will not happen overnight. However, the technology now offers the foundation to make possible such scenarios and fields of application that have been set in motion by innovation and competition. 5G therefore has a key role to play in the transformation to a gigabit society.

InNOVAtion: Which environments do you consider to be predestined for this initially?

HBE: Those with a high denseness of devices, end-to-end networking or a large number of interconnected individual devices. The inclusion of sensors and actuators via the Internet of Things gives 5G a crucial role. In line with this, the main areas of application today in Industry 4.0 can be outlined as 'lights-out factories', for example, in which primarily machines and just a few employees manufacture goods in a fully automated way. I think logistics is another area, with more links between individual modes of transport. Smart farming is already creating numerous promising solutions, such as the use of large amounts of data, including meteorological data, related to comparatively small areas, with a high degree of automation. Of course, there are intensive discussions right now about power supply: A decentralized energy transition that includes the addition of flexibility to the grid and the interconnection of producers, suppliers, and consumers will also require 5G. Popular keywords here are smart grids, smart cities and smart metering.

InNOVAtion: So there are plenty of use cases – where and how does Micro-Nova come into play?

HBE: MicroNova can and will engage effectively wherever we can support innovation and mitigate complexity from a technological point of view. This is because both the industry itself and the technology used are becoming more complex, and as a result the required know-how is becoming more extensive and diversified. This goes hand in hand with the fact that knowledge and skills have to be developed and intelligently linked or interconnected. This in turn means that solutions are also becoming more complex and expansive. In concrete terms, for MicroNova this means that we will continue with our work in net-

work management with passion and dedication. And we will complement this by developing our solution expertise in application areas that coincide with our know-how. At the moment we are in the evaluation stage in this regard.

InNOVAtion: What will this solutions expertise look like?

HBE: First of all, I should emphasize that this newly launched transformation is an ongoing process which we will continue to develop. We are making plans here over a period of three years, with due flexibility in terms of content. Thereby we are building on our ability to manage multiple stakeholders in innovative projects with a focus on quality. Moreover, we will enter into meaningful, targeted cooperative ventures. This will also allow us to develop complex solutions with individual, smaller building blocks and specialist knowledge. MicroNova consistently meets the requirements of our long-standing and loyal customers, as well as those of the market and the technical evolution of the entire industry. We want to make a valuable contribution to the network-centric world, with all the opportunities it brings. ■

„MicroNova can and will engage effectively wherever we can support innovation and mitigate complexity from a technological point of view."

– Hinrich Bey,
Director Telco Solutions,
MicroNova AG

Profile: Hinrich Bey

Hinrich Bey has worked at MicroNova since July 1, 2021, initially as Deputy Director Telco Solutions and since January 1, 2022 as Director. He holds a degree in business administration and has many years of experience in the industry, including more than ten years at Telefónica Germany, where he most recently held the position of Head of Operations. Before and after this period, Hinrich Bey worked as an independent consultant and interim manager in various industries, where he was able to develop extensive knowledge in technical product management and business development.

New Tools for IT Administrators

Secure remote connections to critical business systems and excellent remote support

TEXT: Editorial staff   PICTURES: © Jacob Lund / Shutterstock.com; © ManageEngine

Benefits of Access Manager Plus for companies

» Increased productivity for privileged users
» Fewer attack vectors for hackers
» Improved and easy administration
» Enhanced regulatory compliance
» Tighter overall access governance for increased IT security

Although working from home has become the norm for employees, it is still posing challenges for IT departments. ManageEngine now provides even better support to administrators with two new solutions for secure remote access by privileged users to critical business systems as well as remote user support: Access Manager Plus and Remote Access Plus.

Access Manager Plus

"Access Manager Plus" is Manage-Engine's new privileged session management software that allows companies to regulate access to remote systems through secure channels from a unified user interface. The solution has mainly been designed for privileged users; these include, for example, administrators whose remote access represents a major challenge in terms of security and data protection on account of their extensive access permissions to critical systems. With Access Manager Plus, companies can give the right people direct access to every component of the IT infrastructure, regardless of their location.

Access Manager Plus also offers comprehensive auditing and monitoring functions that provide complete and real-time monitoring of privileged access use. For example, sessions can be recorded for audit purposes and archived as a video file. The shadowing function provides an extra level of real-time monitoring for particularly sensitive access.
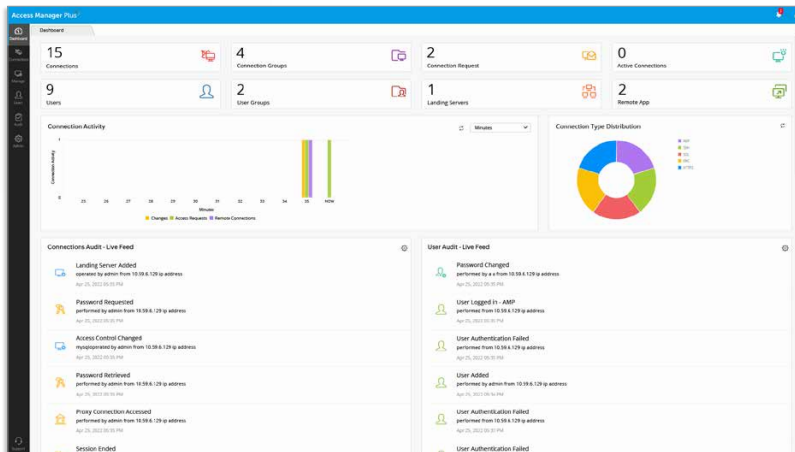
1 On the Access Manager Plus dashboard, administrators can see at a glance which connections and accesses are currently in use.

2 With the tools in Remote Access Plus, help desk technicians can easily remotely shut down or wake up employees' remote endpoints.

Remote Access Plus

The second solution, "Remote Access Plus", has been developed by Manage-Engine specifically to provide IT support to remote employees. The remote access software for companies helps system administrators and IT help-desk technicians to quickly and easily track down and resolve errors on remote endpoints. Moreover, it does not matter whether it is a Windows, Mac or Linux computer: All three operating systems are supported.

The software also has powerful tools and features such as advanced remote access control, system manager, wake on LAN, remote shutdown, remote file transfer, and many more. These tools and features enable IT departments to offer excellent remote support to employees and significantly reduce troubleshooting time. ∎

Free trial versions

Further information on the tools presented here and free 30-day trial versions are available from the following links:

» **Access Manager Plus:** https://www.manageengine.de/accessmanagerplus
» **Remote Access Plus:** https://www.manageengine.de/remoteaccessplus

Patch management for secure computers at the ZEIT-Stiftung – including in the home office

Desktop Central automates patch management and software distribution

TEXT: Editorial staff   PICTURES: © ZEIT-Stiftung Ebelin und Gerd Bucerius

ZEIT-Stiftung Ebelin und Gerd Bucerius:

» Sector: non-profit foundation
» Employees: approx. 40
» Head office: Hamburg
» Established: 1971

The non-profit foundation ZEIT-Stiftung Ebelin und Gerd Bucerius (ZEIT-Stiftung) is based in Hamburg and promotes research and science, art and culture, as well as education and training. The foundation was established in 1971 by Gerd Bucerius and bears the name of its founder, the title of the weekly newspaper Die Zeit, which he co-founded, and Ebelin, the nickname of his second wife, Gertrud Ebel.

Manual patch management with security risks

The ZEIT-Stiftung had been using an open-source solution to provide patches and software updates to the endpoints of its roughly 40 employees. However, since continued development of the tool had stopped, system administrator Thomas Gland had to search for important updates himself and deploy them manually, which took up an enormous amount of his time. Despite all his efforts, while also looking after all the IT needs of the academic staff and their assistants, he always had a bad feeling when he was sick or on leave: Systems would remain unpatched until he returned, even if there were critical security updates.

This was reason enough for Thomas Gland to look for a new solution that would take some of the burden off him and provide greater security. Since the two tools he initially tested (GFI LanGuard and SCCM from Microsoft) proved to be too complicated or oversized for the foundation's needs, the IT expert continued his search. Searching online, he came across the unified endpoint management solution Desktop Central from ManageEngine. He installed the free trial version to put the solution through its paces for up to 30 days.

ManageEngine Desktop Central

Thomas Gland was particularly impressed by the intuitive use: "If software is self-explanatory and I don't have to research how something works, that's a big plus for the product." Another plus point for him was the German-language customer service: "With other vendors, you often end up somewhere in English-language support. That can get very complicated, especially with technical topics. That's why I was very happy about the German support."

The first contact with the ManageEngine team at MicroNova came during the test phase. What struck the system administrator as positive was how quickly support got back to him and took care of the ZEIT-Stiftung's concerns – even though the organization was 'only' using a trial version. "In my

discussions with MicroNova, I discovered that the software can do much more than just patch systems," says Thomas Gland.

Less time required, greater security

All in all, it took only four weeks from installation of the trial version to full rollout. Updates can now be deployed on endpoints without a VPN connection. Additional security is provided by the "Secure Gateway" add-on for Desktop Central, through which the systems receive updates as soon as they have an Internet connection – even without a connection to the WSUS server or the organization's network. In addition to patches, the new solution is also used to provide software. "Especially during the COVID-19 pandemic, when we had to move quickly to a work from home setup, Desktop Central was of great benefit," says the system administrator.

Another branch office in Hamburg also benefits from the new solution: Since there is no fast Internet connection there, the ZEIT-Stiftung uses an on-site Desktop Central distribution server. The server downloads updates once and then distributes them to the computers to conserve line capacity.

The Remote Control integrated into Desktop Central is another feature that Thomas Gland wonders how he ever did without: If an employee has problems with their computer, the IT manager can simply access the affected device via the tool – regardless of whether the employee or system administrator is currently working in the office or from home. This makes it much quicker and easier to resolve IT problems.

The reports included as standard in Desktop Central and the dashboard, which is always open for Thomas Gland, also make work easier: For example, he can see at a glance whether AD groups have been modified or admin rights have been granted. In addition, he receives important information on software distribution or on systems which are missing important patches.

Automation reduces the IT workload

Thanks to Desktop Central, standard programs and patches are now automatically rolled out on the ZEIT-Stiftung's computers. This keeps the systems up to date at all times. At the same time, IT benefits from having more time and security.

Thomas Gland has already used some of the hours gained to make new plans: The next step is to enable Desktop Central to wake computers at night for software updates to minimize disruptions to employees as far as possible in their work during the day. ■

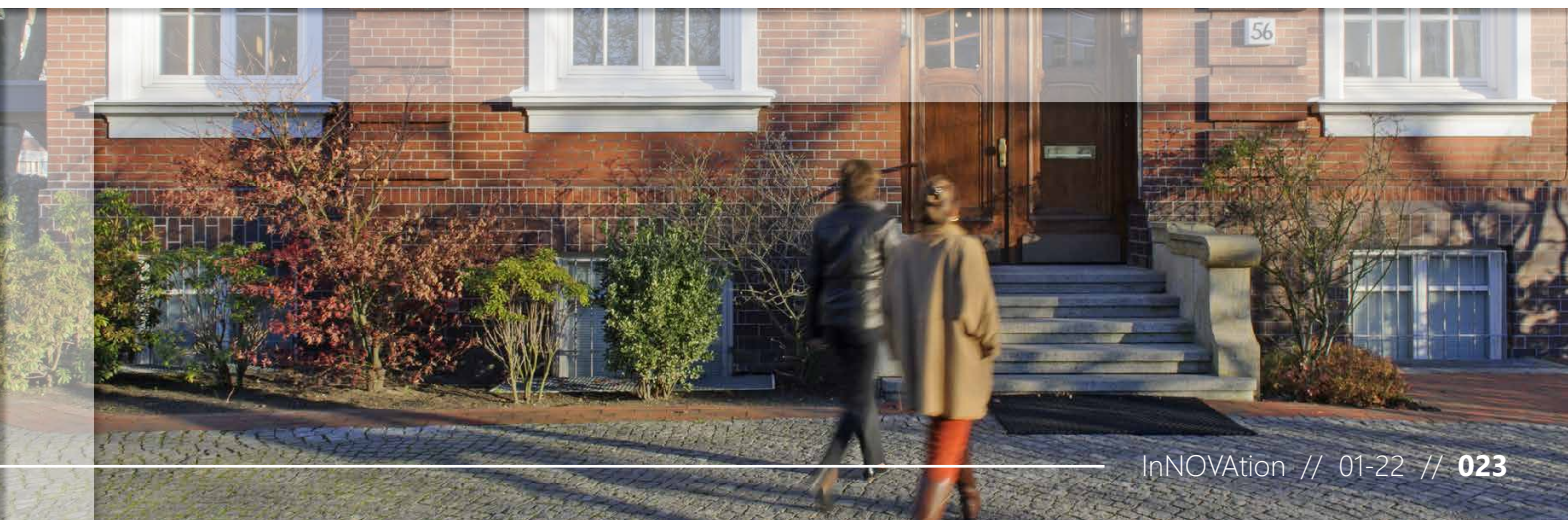**Z** **ZEIT-Stiftung**
Ebelin und Gerd Bucerius

„I save an enormous amount of time because I no longer have to check for updates myself. Desktop Central does that automatically, so I always have up-to-date patched computers."

– Thomas Gland,
System Administrator,
ZEIT-Stiftung Ebelin und
Gerd Bucerius

Customer benefits:

» Less time spent on routine tasks
» Improved IT security thanks to automatic updates
» Secure working even from the home office
» Intuitive and user-friendly
» German-speaking support

Q3 Projektübersicht

Diesen Monat	Verantw.	Priorität	Zeitleiste	Deadline	Status
Kickoff-Materialien fertigstellen		★★★★☆		10. Sept.	Erledigt
Ziele anpassen		★★★★★		16. Sept.	In Bearbeitung
Wichtige Ressourcen identifizieren		★★☆☆☆		17. Sept.	Blockiert
Plan testen		★★★☆☆		21. Sept.	Erledigt

... Monat		Zeitleiste	Deadline
...nervertrag aktualisieren	★★☆		12. Okt.
...ung durchführen			18. Okt.
...achen			2... Okt.

Project management on a large scale

Security, scalability: often, project managers must consider and work across multiple departments. monday.com is the ideal tool for this, also for car manufacturers and automotive suppliers.

TEXT: Felix Bauer   PICTURES: © G-Stock Studio / Shutterstock.com; © monday.com

An overview of monday.com

» Optimal project overview
» Efficient collaboration within the team – even when working from home
» Numerous templates make getting started easy
» Fully customizable
» Automations for recurring tasks
» Attractive visualizations and meaningful reports
» All information from different tools can be pooled – thanks to numerous integrations

As a cloud-based project management tool, monday.com can very quickly help teams to work together more efficiently. All communication about the project takes place within the tool itself or can be centrally pooled and organized thanks to numerous integrations – such as Microsoft Outlook, Trello, Jira, etc. In addition, processes, work steps, etc. can be customized and automated. In most cases, a few clicks are all it takes to quickly help take the effectiveness and efficiency of the whole team to the next level.

All information relevant to the project – from the task list, e-mails and chat messages to files – is centrally organized in monday.com, making it easy to find. The manufacturer justifiably calls the tool a "Work OS," i.e. an operating system for operational work.

These advantages are relevant to companies of all sizes and across all industries. monday.com has therefore designed a portfolio of subscription models; its highest level "Enterprise" includes a range of functions and a memory capacity – one terabyte – that are ideal for large teams and extensive integrations into company processes. Security and scalability are a key focus.
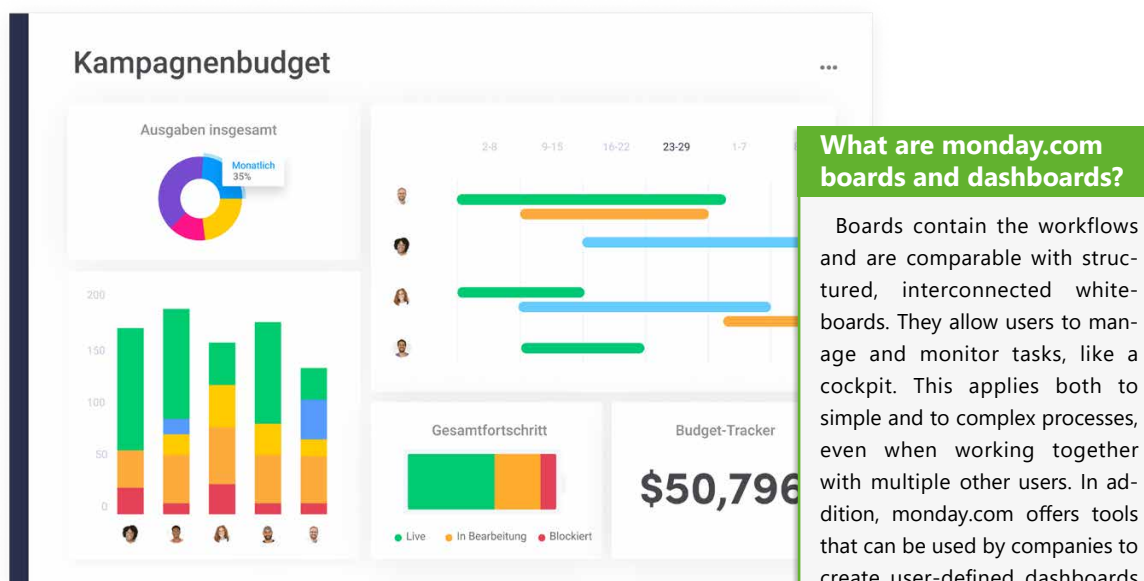
Enterprise level: 250,000 automations and integrations per month

Elimination of manual steps, automation of processes, integration into other platforms: monday.com makes all this possible. Users of the Enterprise license receive a particularly high-performance package. It enables ten times more actions than the Pro edition. This means that companies can implement up to 250,000 actions for automations and 250,000 for integrations per month – more than enough to manage every project successfully.

How is an automation action calculated? Every automation formula has a trigger and one or more actions. Our example: "When a status changes to 'Done,' then delete the item." In this case, the trigger is "When a status changes to 'Done'" and the action is "then delete the item." If this formula is triggered three times, three elements will be deleted as a result – this then means using three of the actions within the limit of an account's plan. Usually, if an automation formula is triggered, one monday.com action is used. However, there are some formulae that involve multiple actions.

The Enterprise plan is recommended if teams or companies:

» Would like to use automations and integrations multiple times a day – because this level of the solution is designed for using complex automations and integrations, making it ideal for maintaining multiple two-way synchronization setups.

» Would like to manage multiple work processes in a growing company. This may be the case if the account is used for multiple departments and multiple workflows (and maybe even more in the future).

» Would like to use monday.com as a CRM system or for managing payroll accounting or other calculations.

Visualization on a large scale

Dashboards are a great way of displaying the most important information in a single place. Using the 15 available widgets, team members that use monday.com via the Enterprise plan can track project progress, monitor the budget, estimate their fellow team members' workload and much more, at any time. With the Enterprise plan, companies can create as many dashboards and widgets as they like. Unlike with the Pro edition, every dashboard can show information from up to 50 boards.

Security & logging in

In its automotive industry situation overview, the German Federal Office for Information Security (Bundesamt für Sicherheit in der Informationstechnik – BSI) explicitly references the risks for supply chains in the automotive industry. And sometimes, the only way to avoid the situation getting worse is to press the emergency stop button which cuts off everything: with the panic button integrated into monday.com, teams can lock their account immediately on a temporary basis in case login details have been compromised. From then on, no one can gain access until an administrator has sent a request to the Customer Success Team at monday.com. This function is exclusive to the Enterprise plan.

* https://www.bsi.bund.de/DE/Service-Navi/Presse/Pressemitteilungen/Presse2021/210907_Lagebild-Automotive.html

Using the Audit Log, admins can also see when team members last logged in to the account, which device they used and their IP address for that session. This enables administrators to identify suspicious activity and, if necessary, activate the panic button.

At the same time, users no longer need to memorize passwords: access via Security Assertion Markup Language (SAML) enables users to access monday.com securely via an identity provider of their choice. Login takes place via an existing SAML account such as Okta, One Login or a user-defined SAML. The identity of the user is sent directly to monday.com by the identity provider. SAML can be activated via monday.com in a few simple steps – conveniently and securely.

IP restrictions

Another security benefit of the Enterprise plan is that administrators have the option to define the IP addresses that can access an account. This may be necessary if companies want to restrict account access to specific users;

Data protection and security

Data protection and security are the top priority across the board at monday.com. Processing customer data in a responsible manner is one of the core values of the company. A particularly clear example of this is the company's fulfillment of the requirements of the Health Insurance Portability and Accountability Act (HIPPAA): with the HIPAA-compliant Enterprise plan from monday.com, even sensitive health data can be stored in the system.

for example, users who log in from a specific location (e.g. the office), who use a specific VPN, etc. The IP restrictions also apply to the monday.com app for smartphones; even via the app, users can only log in via permissible IP addresses.

However, there are also exceptions to the IP restrictions: for example, if users share a board with a contact person, these views are no longer restricted to the IP addresses stored in the list. Also, the links that are used by participants to access a survey created using monday.com are obviously not subject to the IP restrictions. Put simply: anyone who has a link to a monday.com form can use the link.

Even more service

Companies that opt for the Enterprise version of monday.com also benefit from another advantage – that is to say a personal point of contact in the support team. As the name suggests, these Customer Success Managers are also there to ensure that monday.com is being used in the optimal way. They help teams to organize themselves even more efficiently, which in turn has a direct positive impact on the Return on Investment (RoI).

Whether you choose the Standard, Professional or Enterprise level, the MicroNova team is happy to provide customers with advice and assistance regarding professional project management – they are just an e-mail or phone call away. Interested in a trial version? Then use the following link and start boosting your efficiency today: https://tinyurl.com/work-os ◼

Tip

Another Enterprise extra: tailored onboarding is available from 25 users. For customers, Micro-Nova holds a free-of-charge workshop lasting at least four hours depending on the size of the edition. This means you can be sure that your processes will be optimally implemented in monday.com and that your key users will receive the best training.

Success-Story from monday.com:

Location	**Global**
Industry	**Automotive**
Employees	**131,000+**
Use case	**PMO**

> "monday.com allows us to centralize our work into one unified workspace. The impact is not limited to any one function but carries plant-wide. It also reduces non-value added work and encourages cross-functional collaboration."

Tommy Thrash
Engineering Manager, Advanced
Manufacturing Technology | **Nissan Motor Corporation**

The challenge

Nissan's plant in Canton, Mississippi, is a full assembly plant, which means that it handles everything from car stamping to inspection.

Aside from daily operations, the plant runs two routine shutdowns for restoration projects, changeovers, upgrades, and other time-consuming work.

The Nissan engineers involved in planning and running these shutdown periods were heavily reliant on spreadsheets and identified the following as their main challenges:

- Duplicative work and wasted time
- Siloed departments with limited visibility
- Lengthy sync meetings and email chains
- Manually collating project reports

Tommy, the engineering manager, needed to find a powerful software that would enable everyone to run large-scale projects and initiatives more efficiently.

The solution

monday.com Work OS was introduced to Tommy by one of Nissan's paint engineers who was already using the software within his department. Receiving great feedback, Tommy decided to bring monday.com into his department as well.

Once Tommy implemented monday.com, the department and all their stakeholders immediately realized its benefits, including:

- Gaining 360° view of a shutdown period with Gantt charts and dashboards
- Easily managing new project requests with monday.com forms
- Mitigating risks with real-time automated notifications
- Seamless cross-functional collaboration through updates and @mentions
- Effortless resource allocation - knowing who's available and who's not
- Tracking and monitoring projects from anywhere with monday.com on mobile
- Accurately forecasting resource and financial needs for future projects

The impact

3x
ROI

$49,000
Saved per month
on average with
monday.com Work OS

1,460 hrs
Saved per month
on average with
monday.com Work OS

monday.com

55 reasons to celebrate

35 years of MicroNova + 20 years of InNOVAtion – a Short Retrospective

TEXT: Editorial staff

Back when MicroNova celebrated its 25th anniversary, the occasion was marked by a big party which culminated with a visit from the prime minister of Bavaria. Ten years later, for our 35th birthday, things will be a little more low-key. Even so, it's still a good opportunity to look back over the intervening years, especially as we also have a second, smaller anniversary to celebrate: that of our customer magazine InNOVAtion, first published 20 years ago. For both the company and its semi-annual magazine, a lot has happened – including quite a few major events.

For MicroNova itself, in the ten years that have passed since its 25th anniversary, the most important aspect was surely the handover by founder Josef W. Karl to his son Maximilian. Prepared well in advance, this way was ensured that the business could continue to advance in line with some key underlying principles: quality-based growth by the company's own efforts, independence, continuity, and long-term and sustainable thinking, actions, and economies.

Values Matter – as Always

This value-based approach is further supported by Josef W. Karl's ongoing commitment to the Supervisory Board. After all, the actual handover in 2019 was preceded by the founder's move there in 2016. In parallel with Josef W. Karl's appointment to that body, Orazio Ragonesi, who had served on the Management Board for over a year, was appointed as CEO. He had already been with the company for more than 15 years and had previously deputized for Josef W. Karl over a long period.

When Orazio Ragonesi became an additional member of the Management Board in 2015, Dr. Klaus Eder also joined the executive team – bringing with him a great deal of leadership experience. Since then, as COO, he has been responsible for MicroNova's operational activities. A key factor in the success of this executive team, which since 2015 has also overseen the activities of sister company ks.MicroNova GmbH, is the fact that both the Supervisory Board and Management Board (the owners in the case of ks.MicroNova GmbH) see themselves as a team working in partnership.

„We are very happy about our 35th birthday. This written record of our history would not have existed without our customers, our partners, and all of the employees across the whole MicroNova Group. I'd therefore like to take this opportunity to thank them all sincerely."

– Orazio Ragonesi

20 Years of InNOVAtion

To properly detail the countless innovations and solutions achieved in Micro-Nova's history, we would need far more space than these two pages, as shown by the fact that the customer magazine InNOVAtion has been now been in publication for 20 years. In each of its editions, the magazine provides technical details of our portfolio, supplemented by insights from managers and external experts. As with the content, things have moved on in terms of the magazine's design. This is evident with just a quick glance at the title page of the first edition.

In terms of its distribution, too, there have been changes, as InNOVAtion has been available as an online e-paper for some years now. With the onset of the Covid pandemic and the general advance in remote working, the PDF variant – which has been available for an even longer period – has also gained further momentum. Not least because MicroNova cares about the environment, we would like to ask you, our readers, in view of our print run of now 1,000 copies: If possible, please feel free to take advantage of the option and switch to the digital version. To do so, simply register on the MicroNova website: https://tinyurl.com/MN-InNOVAtion. Thank you very much.

Expansion

The year 2015 also saw the founding of a MicroNova subsidiary in the Czech Republic, based on the principle of being close to the customer. Another milestone for MicroNova was its move into the Vierkirchen Business Park during that decade – in 2018, to be specific. Both of these events demonstrate the group's growth, which was only possible thanks to its many loyal customers and the large number of new ones it won. As a result, MicroNova now employs around 320 people – almost three times as many as at the time of its 25th anniversary. It also has three times as many sites as it did ten years ago.

However, the company's growth has encompassed far more than its team size, client base, or locations. For instance, the number of its partnerships has steadily increased, in terms of both the companies with which MicroNova cooperates and the group's collaboration with other organizations. These include the 5G Berlin innovation hub, the O-RAN Alliance, and the "Electric Mobility South-West" and "Fuel Cell BW" clusters. MicroNova also benefited from growth in terms of the certifications it holds, such as the TISAX® information security standard.

Onward and Upward

As a result of this progress, the course has been set to ensure the company's employees can continue to successfully shape the future in conjunction with the Management Board and in concert with our customers. Put simply, there are 55 reasons to celebrate! ∎

Embrace the new, firm the tried and tested

Dear Reader,

MicroNova has been around for 35 years, since 1987. In the course of writing this article, I browsed through the 30th anniversary issue of InNOVAtion – it is remarkable how much has happened in 'just' five years. Back then, we proudly heralded the company's new building at our headquarters in Vierkirchen near Munich. Now, in 2022, our beautiful offices have had much fewer people inside over the last two years than we could have ever imagined due to the pandemic ... just one of many changes.

But complaining has never been my thing. As a society and a company, of course we must focus on the new, but not at the expense of throwing out the tried and tested. The New Work model, for example, has proven to be efficient and effective in equal measure, for which I would like to thank all our teams here at MicroNova for continuing to deliver great results. Time savings and the environment are undoubtedly good reasons to work from home at times, and team spirit and creativity benefit when people can talk face-to-face on site. However, it is still important to pay close attention to ensuring that the latter is possible and works well.

There are other good examples of positive change that openly embraces the new and maintains what is already established. I am talking, for example, about digitalization, which can structure, simplify and accelerate processes – and which we have also been able to roll out at MicroNova to great success. Our digitalized processes are impressive and can be measured. For this, too, my thanks to those that have put things into action.

Since the 1990s, we have been living in what feels like choppy times with permanent, ever faster change. The Internet, then the mobile Internet, and complete global quasi-real-time networking have created a dynamic arguably without precedent in human history. We in Germany will have to work very hard to maintain as strong a position as possible in the world. But this will only work if we are open to innovation. Some keywords are artificial intelligence, 5G and digitalization, which we should initially look at as an opportunity before we think about the challenges. Together with our Executive Board and my colleagues on the Supervisory Board, I am committed to ensuring that this spirit is applied to all topics, including our technology and our understanding of innovation.

And I wish and hope that all companies and people in this country will internalize this mindset, because standing still would mean going backwards. Without the ability to restructure and reorganize, we would still be working with tubes or using floppy disks, for example. Only those who see change as an opportunity can (positively) shape the transformation themselves. And as we all know, there is still plenty to be done in terms of sustainability and the environment! And while we shall tackle those issues, we must not forget other aspects such as the security of critical infrastructure.

If you would like to look back at the many changes, improvements and innovations from 35 years of MicroNova: www.micronova.de/historie is a great place to start. Backing innovation, MicroNova will continue to do everything it can to make a difference, be it small or big, to the – hopefully soon more peaceful – world, and to support our customers in the process.

I would like to end my article with a quote from the former German President Gustav Heinemann: "Those who do not wish to change anything will lose what they wish to preserve."

With warm regards,
Josef W. Karl

Josef W. Karl
Chairman of the Supervisory
Board of MicroNova

The editors of InNOVAtion spoke with MicroNova sole shareholder and Supervisory Board member Maximilian Karl (MK) about the company's 35th birthday.

InNOVAtion: MicroNova is a little older than its owner – how does that feel?

MK: As far as the human aspect and the company itself are concerned, first I look at the life's work of my father in awe and then with respect at the entire team that makes MicroNova's success possible in the first place. Besides, I grew up with the company, so to speak. That creates a connection and leaves its mark. It awoke my passion for technology. And when I look back now, as far as I can remember, there has been an unbelievably large-scale push in development. This also motivates me personally.

InNOVAtion: How does that motivate you?

MK: I was born in 1991, the year the first version of the Linux kernel was released. The World Wide Web went live just before I was born. Now when I see how the web and Linux have developed in this time and how many of our solutions are based on these technologies or at least make intensive use of them... this naturally motivates me to be an active part of this development. MicroNova has so many opportunities and so much potential thanks to its great clients and our creative and solution-oriented teams.

InNOVAtion: Where are the greatest opportunities and potential?

MK: Fundamentally, MicroNova helps to make distance less and less relevant – whether by bridging these distances physically or digitally. When I look at the transformation of the powertrain or autonomous, connected vehicles, there is definitely great potential here. And for a world in which more and more people and machines want to communicate with each other in more and more different ways, again we can make a valuable contribution. These two points are well served by our Testing Solutions and Telco Solutions divisions.

InNOVAtion: Where do Enterprise Solutions fit into the picture?

MK: Our Enterprise Solutions can be understood as a kind of connective link: They ensure that IT infrastructures work reliably and that teams can work together efficiently – wherever the team members are located. All in all, with our three mainstays, we are already committed heart and soul in areas where fantastic opportunities lie. This is where we will continue to focus all our energy. And we will also look to the left and right of us and be open to change and to new innovation potential. ■

Maximilian Karl
Sole owner and member of the Supervisory Board of MicroNova